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EVIDENCE FOR LACK OF TERRITORIALITY IN TWO SPECIES OF HAMADRYAS (NYMPHALIDAE)

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A TERRITORY AS DEFINED BY KENDEIGH (1961) "is any area defended against intruders." Today, it is a well known fact that many animals have well established territories for either their entire lives or else for only brief periods during their lives, e.g., during the breeding season or at feeding times. This behavior pattern frequently has been reported for vertebrates—birds (Hinde, 1956), mammals (Seton, 1909, 1925-28), amphibians (Sexton, 1960), fish (Hasler and Wisby, 1958), turtles (Cagle, 1944); some invertebrates—snails (Edelstam and Palmer, 1950), wood ants (Elton, 1932), dragonflies (Jacobs, 1955). In regards to butterflies, it is known that many species (*Phyciodes tharos*, *Precis coenia*, *Lycaena phleas*, *Danaus plexippus*, several angle wings of the genus *Polygonia*) are pugnacious, chasing any moving object that gets within close range (Klots, 1951). It even has been recorded (Klots, 1951) that males of *Lethe sp.* adopt favorite perches on tree trunks which they resume day after day, darting out occasionally in order to drive away other males. If this is the case, it can be said that these species exhibit territoriality. However, there is no experimental evidence to support this idea which is based solely on field observations.

Closely related to territoriality, is the subject of home range—"that area regularly traversed by an individual in search of food, mates and caring for young" (Kendeigh, 1961). The few experiments undertaken with butterflies (Dowdeswell, Fisher and Ford, 1940, 1949; Evans, 1955; Abbott, 1959; Faler, 1959; Ehrlich, 1961) show that some species of butterflies do not wander very much during the course of their lives but rather are sedentary and tend to remain in relatively small areas. In other words, they have small home ranges.

The present paper sheds a little light on these two areas of behavior regarding two nymphalids, *Hamadryas februa gudula* Fruhstorfer and *Hamadryas guatamalena guatamalena* Bates.

While engaged in collecting butterflies in the Tuxtla Mountains, Veracruz, Mexico (summer, 1962), I became aware that there were fairly large populations of both *Hamadryas februa* and *Hamadryas guatamalena* in a small (two acres) tract of land given over to the cultivation of coffee. These butterflies were a conspicuous part of the landscape for whenever any moving object entered the immediate area, individuals which previously were resting on the trees, darted out, making the peculiar clicking noises that are so characteristic for the group (Ehrlich & Ehrlich, 1961). After a few seconds of rapid zig-zag motions, they again usually took up resting positions on either the same trees or else on others in the same general vicinity.

The attitudes of rest for these two species are quite interesting. Individuals rest head downward on the trunk or larger limbs with their wings stretched out horizontally and held flat against the bark. In this position, individuals are very much indiscernable for the somber color patterns of the dorsal side of the wings blend in perfectly with the bark and its lichen encrustations. Trees of the species *Inga spuria* Humb. & Bonpl. (Leguminosae) which has been planted for their value as shade trees in coffee culture were the tallest in the area and were most often used for resting.

After collecting in this area for several days, I noticed that many of the *I. spuria* trees habitually seemed to have one or more individuals of *H. februa* and *H. guatamalena* resting on them. A good friend of mine (and an ardent butterfly collector, also) remarked that he had observed this same type of phenomenon throughout Mexico and parts of Central America and that he thought that individuals rested repeatedly on certain apparently "favored" trees and defended these positions against all intruders. If this were the case, both species exhibited territoriality. This had to be determined.

In this same tract were numerous orange trees. These (the larger trees in particular) served as excellent feeding stations for both species of *Hamadryas* as well as for several species of *Prepona*, *Smyrna*, *Anaea* and *Caligo*. Termites being numerous in the area, frequently made excavations into the bark and sap wood of these trees and consequently caused sap to ooze out from the burrowings. This sap combined with moisture (either from heavy morning dew or from rainwater) gave off a strong acrid odor which was quite noticeable to me for a distance of a meter or more. Apparently this fermenting sap was highly

prized by the above mentioned butterflies for at such times (when conditions were favorable for production of good quantities of sap and for the fermentation thereof), large numbers of them were seen feeding on the material. Because of the high population densities of *Hamadryas* in the area, it was a common everyday sight to see several individuals of each species feeding simultaneously on these trees. When a new arrival tried to join the feeding association, it usually was chased away. However, sometimes it was able to force its way into the group and thus take up a feeding position. It had to be determined whether territorialism was being exhibited here, that is, whether or not the same individuals were feeding at the stations day after day.

In an attempt to get some quantitative data concerning the above phenomena, three simple capture-recapture experiments were performed.

EXPERIMENT I: RESTING HABITS OF *HAMADRYAS FEBRUA GUDULA* FRUHST.

Three trees which, after several daily inspections proved to be fairly constant resting places for *H. februa*, were selected and marked, each with a distinct and different color. The trees were situated in a triangular pattern and were approximately 10 meters apart. All butterflies on these trees were captured, marked using the 1-2-4-7 system of Ehrlich & Davidson (1960), and immediately released. At the same hour on the following day, the trees were inspected and all butterflies found resting upon them were captured, checked and released. Any new, unmarked individuals were marked. All other trees within a distance of 20 meters in all directions were checked, also. It should be mentioned here that when approaching the trees, considerable caution was exercised so that the butterflies were caused the least amount of disturbance. This same procedure was followed for 11 consecutive days.

The results of this experiment proved to be rather interesting. Of 24 individuals (20 ♂♂, 4 ♀♀) of *H. februa* marked during the 11 days of the experiment, only 5 specimens were recaptured on the same trees from which they were taken originally. Of these 5, only 3 were captured more than once on the original tree. Of these same 24 individuals, only 9 were recaptured on nearby trees. Thus, it appears that most individuals do not regularly frequent the same trees or even other similar trees in the nearby area, and that there is a constant influx of new individuals from other surrounding areas.

EXPERIMENT II: RESTING HABITS OF HAMADRYAS GUATAMALENA GUATAMALENA BATES

Two *I. spuria* trees which seemed to be visited frequently by members of *H. guatamalena* were selected. All butterflies found resting on them were captured, marked and released. The following day the trees were inspected and all individuals found upon them were checked. All new, unmarked specimens were marked and released. Again, all other trees within a distance of approximately 20 yards were checked. This procedure continued for 7 consecutive days.

Of 9 individuals (7 ♂♂, 2 ♀♀) of *H. guatamalena* marked, none were recaptured on the trees from which they were taken originally. Of these 9, only 2 were recaptured in the immediate vicinity. Thus, it appears that *H. guatamalena* also does not habitually frequent the same resting spots but that new individuals enter the area from adjacent habitats.

EXPERIMENT III: FEEDING HABITS OF *H. FEBRUA* AND *H. GUATAMALENA*.

As mentioned previously, several of the Citrus trees in the study area served as excellent feeding stations for both species of HAMADRYAS. In an attempt to determine if feeding territories existed for the species, two highly productive trees situated about 10 meters apart were marked with different colors and all specimens of HAMADRYAS found on them were marked with corresponding colors. The same procedure of checking was followed here.

After 7 consecutive days of checking, the following results were obtained. Of a total of 15 individuals (5 ♂♂, 3 ♀♀ of *H. februa* and 3 ♂♂, 4 ♀♀ of *H. guatamalena*) marked, none were recaptured on the marked trees or on any other trees in the general vicinity. Thus, it appears that no evidence exists for the presence of feeding territories in either species.

DISCUSSION

It appears from the three simple capture-recapture studies described above, that there is no evidence for territoriality in either *Hamadryas februa* or *H. guatamalena*, two species of nymphalids which upon first observations, appear to be rather sedentary in their habits; it appears that these species do not frequent the same rest spots daily nor do they have preferred feeding places. From field observations, it appears that the resting spots are gotten on a "first come, first serve" basis and that the more aggressive individuals usually gain control of the desired spots. These same individuals in turn retain their

positions until driven off by intruders or until intrinsically motivated to go elsewhere. Therefore, I think that it is better to say that these 2 species are very pugnacious.

One might argue that since these positions are defended, there exists at least a sort of "transient territoriality." However, close field observations do not bear this out; after the departure of an intruder, individuals may or may not return to the same spots. Indeed, it appears that there is an equal chance of them selecting other resting areas. Therefore, I do not believe that one can say that these species have even "transient territories."

It is interesting to speculate on the "whereabouts" of the marked individuals. Only on one occasion was a marked specimen recovered outside of the study area. This recovery was made 6 days subsequent to the termination of the three experiments. The insect, a male specimen of *H. februa*, was feeding on the exuding sap of an orange tree which was growing in a cow pasture approximately 100 yards from the original study area. It seems improbable that the marked individuals were injured during the actual marking process for no evidence for this was observed. That this marking technique can be employed with even smaller species of nymphalids without any apparent ill-effects to the specimens, was shown by Ehrlich & Davidson (1960) in their work with the checkerspot *Euphydryas editha* Boisduval. To be sure, the question of predation does arise here: were the marked individuals more susceptible to attacks by such things as lizards or birds? I believe that this question can be answered in the negative for as mentioned above, individuals of both species do not fly a great deal but spend a large amount of their time resting with their wings expanded horizontally and held flat against the bark. In such positions, the small artificial marks on the undersurfaces are completely invisible. Furthermore, flights when made, are of short duration and of such a rapid nature as to cause little chance of the markings becoming detected by predators. Therefore, I think that it is highly probable that marked individuals simply wandered off to surrounding areas and became widely dispersed amongst the multitude of other individuals. I think, then, that it is safe to conclude that these two species do not have small home ranges. An interesting future experiment would be to enlarge the study area and to determine the actual dispersion distances.

In conclusion, it seems that there is no evidence for territoriality in either *Hamadryas februa* or *Hamadryas guatamalena*.

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